REMARKS

In the Office Action of March 4, 2004, it was indicated that the action is final. However, in response to the final Action of August 18, 2003 in a parent application, a response was filed on November 10, 2003, but no answer or advisory action was issued to the response until the present Action issued on March 4, 2004. Since no answer had been issued to the response filed on November 10, 2003, the present RCE was filed on February 18, 2004, i.e. the last date for the response to the final Action of August 18, 2003.

Under the circumstances, it is not appropriate in the present Action to respond to the argument filed on November 10, 2003 and make the Action final. Therefore, please enter the amendment filed herewith.

In paragraph 2 of the Action, claims 1-9 were rejected under 35 U.S.C. 103(a) as being unpatentable over O'Dougherty et al. in view of Allington. In view of the rejection, claims 1, 4 and 7 have been amended, and claims 2 and 3 have been cancelled. Also, new claims 10-12 have been filed.

In O'Dougherty et al., a desired amount of diluent is filled in a tank 12 through a valve 60, and a pump 26 is operated to circulate the liquid through a recirculation line 20 including the tank 20 and sensors 34A, 34B. Then, a valve 32 is opened to add to the line 20 a chemical in a tank 28A, while checking an opening time and opening amount of the valve 32 by a microprocessor 42. The concentration of the mixture in the line 20 is checked by the sensors 34A, 34B, and the diluent or chemical is added to obtain the desired concentration in the line. The opening time and opening amount of the valve are memorized in a memory, and in preparing the next mixture, the opening time and the opening amount of the valve 32 for adding the chemical are used.

Namely, the chemical to be mixed with the diluent is added to the circulation line where the diluent is circulating by the pump

26. Also, the sensors 34A, 34B are used to monitor the concentration of the mixture, and if required, the diluent or chemical is added to the line.

The method of claim 1 is directed to obtain the accurate mixing ratio of the liquid mixture in a liquid transfer device with a low pressure gradient function. In the method, at least two different liquids are sucked into the pump chamber alternately by operation of the plunger and by switching the switch valves to thereby determine an actual mixing ratio of the at least two different liquids mixed together.

In O'Dougherty et al., one liquid is supplied to the tank 12 through the pump 60, and while the liquid is circulating through the line 20 including the tank 12, another liquid is added by the pump 32. Thus, in O'Dougherty, at least two different liquids are not sucked into the pump chamber alternately by operation of the plunger, as defined in claim 1.

In claim 1, also, a mixing ratio error is calculated as a difference between the actual mixing ratio and the predetermined mixing ratio, and the mixing ratio error is stored in a memory. This mixing ratio error is different from precision error of the parts of the pump, speed of the pump, and so on. In O'Dougherty et al., the diluent and chemical are mixed at the predetermined ratio, and the desired concentration is obtained by adding the diluent or chemical after checking the concentration. However, the difference between the actual mixing ratio and the predetermined mixing ratio is not measured based on the error caused by the pumps, unlike the present invention.

In claim 1, the switching timing of the switch valves for the at least two different liquids is corrected based on the stored mixing ratio error in operating the plunger for the practical or actual operation to thereby obtain the accurate mixing ratio of the at least two different liquids. Namely, in sequentially

transferring the at least two different liquids as the practical operation by opening and closing the switch valves for the liquids, the switching timing of the switch valves is corrected. In O'Dougherty et al., the desired amount of chemical is directly added based on the value in the memory. However, the pump error is not considered at all. Therefore, if the amount of the diluent is changed, since the pump error is not considered, the desired concentration is not obtained immediately. The adjustment by the sensors is required.

In claim 1 of the invention, the mixing ratio error caused by the pump is calculated at first, and the pump is operated in the practical operation in considering the mixing ratio error. However, O'Dougherty does not consider the mixing ratio error or pump error. The features in claim 1 of the invention are not disclosed or suggested in O'Dougherty et al.

In Allington, liquids in reservoirs 13, 16 are respectively sucked by pumps 12, 15, and are mixed together for use in liquid chromatography. The pump as shown in Fig. 2 has a diaphragm to be moved by a cam 78 and a rod 57.

In claim 1 of the invention, one pump is connected to the switch valves to receive different liquids continuously by changing the switch valves. However, in Allington, each of the pumps 12, 15 is connected to each of the reservoirs 13, 16 to separately supply the liquids, and the liquids are mixed at the downstream sides of the pumps. The mixing ratio error between the actual mixing ration and the predetermined mixing ratio adjusted by the invention is not considered at all.

When O'Dougherty et al. and Allington are considered, the pumps 32, 60 used in O'Dougherty et al. may be replaced by the pump disclosed in Allington. However, such a combination does not disclose or suggest the features in claim 1 of the invention. In claim 1, the different liquids are supplied by one pump, the mixing

ratio error between the actual mixing ratio and the predetermined mixing ratio is calculated, and the switching timing of the pump is adjusted, so that the desired mixing ratio is obtained instantly. In O'Dougherty et al. and Allington, two pumps are used, but in the invention, one pump is used in transferring different liquids. Even if O'Dougherty et al. and Allington are combined, claim 1 of the invention is not obvious.

In claim 4 of the application, a liquid transfer device includes a pump having a pump chamber with an outlet and an inlet connected to the switch valves, and a plunger slidably situated in the pump chamber for transferring the liquids to the pump chamber alternately through the switch valves to prepare a mixture thereof. In O'Dougherty et al., the pump 26 is used to circulate the liquid, and pump 32 adds the chemical to the line 20, separately. The pump with the plunger connected to the switch valves of claim 4 is not disclosed or suggested in O'Dougherty et al.

In claim 4, further, the mixing ratio calculation portion determines an actual mixing ratio of the mixture mixed at the predetermined mixing ratio by the pump, and the mixing ratio error calculation portion calculates a mixing ratio error as a difference between the actual mixing ratio calculated by the mixing ratio calculation portion and the predetermined mixing ratio. In O'Dougherty et al., the desired concentration is obtained by checking the sensors, so that the amount to be added to the predetermined diluent can be obtained. In the invention, even if the mixing ratio is changed, the correct mixing ratio can be obtained, because the mixing ratio error of the pump is known. The mixing ratio error calculation portion calculating the mixing ratio error between the actual mixing ratio and the predetermined mixing ratio by the pump is not used or disclosed in O'Dougherty et al.

In Allington, the pumps 12, 15 are connected to the respective reservoirs 13, 16 to separately supply the liquids, and the liquids

are mixed at the downstream sides of the pumps. One pump does not supply two different liquids, and the mixing ratio error between the actual mixing ratio and the predetermined mixing ratio is not calculated in Allington, different from claim 4 of the invention.

Accordingly, even if the two references are combined, the features of claim 4 are not obvious.

A liquid chromatograph in claim 7 has the pump, the mixing ratio calculation portion and the mixing ratio error calculation portion as explained in claim 4, which are not disclosed or suggested in O'Dougherty et al. and Allington. The features of claim 7 are not obvious from O'Dougherty et al. and Allington.

As explained above, the cited references do not disclose or suggest the features of the invention. Even if the cited references are combined, claims of the invention are not obvious from the cited references. Especially, in the invention, the difference between the actual mixing ratio and the predetermined mixing ratio made by one pump is obtained to correct the difference therebetween in the actual pumping operation. The features of the invention are not obvious from the cited references.

Reconsideration and allowance are earnestly solicited.

Respectfully Submitted,

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